

Aphididae in Australia.

By G. H. HARDY.

Walter & Eliza Hall Fellow in Economic Biology, University of Queensland.

(Read before the Royal Society of Queensland, 27th July, 1931).

No account has yet been given of the aphides occurring in Australia. A few species regarded as being of importance are mentioned by Tillyard in the "Australian Encyclopedia" and in his "Insects of Australia and New Zealand." Also various authors have treated with some of them in economic literature, but the bulk of the species remains neglected. It seems advisable, whilst introducing this subject in its wider aspect, to summarise all the forms that are known to me, the majority of the species recorded being new to the Australian list.

Nearly all the known species are regarded as being introduced, but there is a form that I have not seen, *Anomalaphis comperei* Baker, on *Acacia* and *Eucalyptus* in South Western Australia; this is an outstanding exception, for there can be little doubt but that it is indigenous, and perhaps the grass-root feeding species of *Anoecia*, found by Mr. R. W. Mungomery in the sugar-cane districts of Queensland together with a species of *Oregma* found by Mr. H. Tryon in Brisbane, may also be indigenous. Again it may prove difficult to show that *Neophyllaphis* on *Podocarpus* and *Greenidea* on *Ficus*, are not of the same category. The bulk of aphides occurring on indigenous plants are, however, introduced, of this there can be little doubt.

Of the subfamily *Aphidinae*, four of the six tribes are found in the Commonwealth. The tribe Lachnini is represented by two species on *Thuja orientalis*, found originally by Mr. F. A. Perkins. One, *Lachnus thujafoliae* Theobald, was described as indigenous under the name *Dilachnus callitris* by Froggatt, whilst the other is a small green form that takes on the generic characters of both *Lachnus* and *Dilachnus* quite indiscriminately, thus making it inadvisable to accept the generic status of *Dilachnus*, unless it be founded on a better basis than that given by Baker in 1920. A grass-root feeding species of *Anoecia* belongs to the subtribe *Tramina*.

The tribe Callipterini is represented by *Neophyllaphis podocarp*i Takahashi, on *Podocarpus elata*, by *Myzocallis* sp. on *Arundinaria* (Bamboo) in the Sydney Botanical Gardens, and by *Myzocallis annulata* Hartig, on various species of *Quercus*.

The tribe Greenideini has the very interesting *Greenidea ficicola* Takahashi, that has been found on every indigenous species of fig tree yet searched, but on no commercial varieties as far as yet known; on one occasion a small colony was found on Oak (*Quercus*).

The tribe Aphidini is one containing numerous species and most pests come under it. It is composed of four subtribes, all in Australia where at least twenty-five per cent. of the genera are represented. In subtribe Aphidina, genera *Anuraphis*, *Aphis*, *Brevicoryne*, *Hyalopterus*, *Rhopalosiphum*, and perhaps others have been found. Under subtribe Cervaphidina, comes the indigenous *Anomalaphis*, the only other known genus being confined to Java. Of subtribe Macrosiphina, *Macrosiphum*, *Macrosiphoniella* *Myzus*, *Rhopalosiphoninus* and perhaps others occur. Finally in the Pentalonina, there are *Pentalonia*, *Idiopterus* and *Fullawayella*, three of the four known genera.

The subfamily Eriosomatinae is represented by the notorious woolly aphid (*Eriosoma*) of apple and another is recorded from pear.

The subfamily Hormaphidinae contains a species of *Oregma* and the world-wide *Cerataphis lataniae* which occurs on orchids and palms, being quite common in glass-house and bush-houses, and in Brisbane it regularly produces the winged form about April.

SUBTRIBE PENTALONINA

Key to the genera of Pentalonina

- | | |
|---|---------------------|
| 1. Radial and median veins typically fused at a point beyond the first branching of the median; rarely separated | <i>Pentalonia</i> |
| Radial and median veins typically separated, but if fused the fusion starts before the branching of the median vein. | 2 |
| 2. Cornicles cylindrical, but usually constricted in the middle, that is invariably the latter half is no thicker than the basal half | <i>Idiopterus</i> |
| Cornicles swollen at the apical half, that is, they swell out in this region so as to be a little wider than at the basal portion | <i>Fullawayella</i> |

I have been forced to modify the characters given by Baker in each of the three genera given above, whilst the fourth genus given by him does not seem to be very distinctive. It appears to me that the whole subtribe is worthy of only generic status and would then be placed under subtribe Macrosiphina. Baker suggested that some of the specific names standing may prove to be synonyms, and this is now found to be the case with one of the two listed under genus *Pentalonia*. Theobald places *Fullawayella* as a synonym of *Idiopterus* but gives no reasons for doing so, nevertheless there is much to commend the action.

Pentalonia nigronervosa Coq.

Pentalonia nigronervosa Coquerel, Ann. Soc. Ent. France, 1859, 259; Wilson, Journ. Econ. Entom. ii., 1909, 346; Fullaway, Ann. Rep. Hawaii Agr. Exp. Stat. 1910, 346; Baker, Bull. Ent. Res. London, x. 1919, 45; Swain, Univ. Cal. Tech. Bull. iii., 1919, 78; Takahashi, Aphid. Formosa i. 1921, 30; and ii. 1923, 89; and v. 1927, 16; Froggatt, Agric. Gaz., N. S. Wales, xxxiv. 1923, 296; Moriera, Inst. Biol. defessa Agrig. Bull. ii. 1925, 28; Theobald, Aphid. Gt. Britain, i. 1926, 361; Magee, Council Scient. Ind. Res. Bull. No. 30, 1927, 64 pp.; Froggatt, Queensl. Agric. Journ. xxx, 1928, 11; Veitch and Simmonds, Pests and Diseases of Queensl. fruits and veg., 1929, 117; reprinted in Queensl. Agric. Journ. xxxii, 1929, 274; Zeck and Eastwood, Agric. Gaz. N. S. Wales, xl, 1929, 675.

Pentalonia caladii v.d. Goot, Contr. faune Indes Néerl., 1917, 57; Baker, Bull. Ent. Res. Lond. x 1919, 45.

Synonymy.—The recognisable difference between *P. nigronevosa* and *P. caladii* exists in the density of the infuscation along the veins of the wing, this being much lighter on the latter form. When *Pentalonia* from *Musa* were placed on *Caladium*, and *vice versa*, those found on *Caladium* were placed on banana stools, those aphides that would normally have produced the dark winged forms on *Musa*, yielded light forms when transferred to *Caladium* and those transferred from *Caladium* to *Musa* produced dark forms. In addition there is a strong tendency for those bred on *Caladium* to be more slender and to differ in the number of sensoria on the antennae, but the same variations in build were found when comparing the aphides from *Musa* in the north of Queensland with those from Brisbane, showing that these differences, as well as that of the wing, may be due to environment.

Host-plants.—*P. nigronevosa* is found throughout the world wherever bananas are grown and all species of *Musa* are liable to be attacked by them.

Strelitzia and *Ravenala*, in Brisbane, are sometimes found to support small colonies, but winged forms have not been found amongst these.

Caladium, as reported under remarks on synonymy, again are found to support colonies, and quantities of winged forms are found there in the autumn, but the plant dies down before the winged ones have reached their peak numbers, so in consequence these colonies do not last their normal life.

Alocasia macrorrhiza, the Cunjevoi, has long been reported as harbouring the species, and Professor E. J. Goddard searched for and discovered some near a plantation visited by him. Later, some plants grown in the University grounds were attacked, and at about the same time those in the Botanical Gardens were found harbouring them. The transference of colonies from *Musa* to *Alocasia* is readily achieved; the colonies take to their new host plant and breed freely. An African species of *Alocasia* in the Botanical Gardens was found harbouring the aphid in large quantities in two consecutive years, both times in the autumn.

Opuntia inermis, growing alongside bananas infested with the aphid, were alighted upon and colonies started on the buds and continued to thrive as long as the flowers flourished. As soon as the sap-flow ceased, though the petals had scarcely time to wither and fall, the colonies died. Apparently they can thrive on the pear only on the flower heads.

Hedychium coronarium was found harbouring the aphid during the autumn of 1929; one plant in the Botanical Gardens supported a large colony in which the winged forms had started to develop.

Alpinia vittata variegata in the glass-house of the Sydney Botanical Gardens supported many colonies during April, 1928; they have been reported from two other species of this genus, *Alpinia rafflesiana* at Kew Gardens, England, and *Alpinia speciosa* in Formosa.

Heliconia, also in a glass-house of the Sydney Botanical Gardens, was found to support colonies in small numbers in December, 1930, at which time none were found on *Alpinia*.

Dieffenbachia magnifica is a plant upon which *Pentalonia* breeds prolifically in Brisbane, and in April, 1928, some wingless specimens of presumably the same species were detected in the Botanical Gardens of Sydney.

The species is also recorded as breeding on *Arum* in Brazil, but none have been found in Australia on this plant which is extensively grown in Brisbane. From California comes one record of a specimen on *Pelargonium*, but it was not recorded as breeding on this plant.

A review of this list of plants upon which *Pentalonia* has been found shows a monocotyledon type of plant dominates. The others recorded consist of the flower heads on *Opuntia* under unnatural conditions and *Pelargonium* based on a not very satisfactory record. Doubtless there are other monocotyledons yet to be found supporting this aphid. I have tried transferring specimens to *Platyserium* the host-plant of *Idiopterus*, and to *Viola*, the host-plant of *Fullawayella*, but in neither case with success.

Natural controls.—Other than those afforded by climatic conditions, there are no adequate controls of *Pentalonia* in Brisbane. Only on one occasion was a larva of a Syrphid fly discovered amongst a colony. I regard this immunity as being due to the habits of the aphid, for they live usually in protected positions, like the unrolled leaf of the banana, on the pseudostem beneath the hard outer covering down to the ground level and even below it. Such positions are usually excessively moist, a condition that may not be congenial to predatory and parasitic insects.

Idiopterus nephrolepidis Davis.

In 1926 and 1927, this species was very abundant on *Platyserium grande* and *P. allicorne*, and occasionally on *Asplenium nidus*, but it was heavily preyed upon by predaceous insects. During 1928 and subsequent years it was difficult to find, and those colonies noted were soon exterminated by predaceous insects. Only once was it found harbouring an internal parasite; the ferns supporting the colonies were grown under cover of a lobby leading to a small central yard of a hotel, where predaceous insects are not likely to penetrate.

Fullawayella violae Pergande.

This species was found on violets in 1926 and during all subsequent years except 1929. It is confined to the winter months of June and July and disappears during August; the winged form becomes very plentiful for a short period. Neither predaceous nor parasitic insects have been found preying upon it.

List of identified aphides and their host-plants.

<i>Auoecia</i> sp.	<i>Echinochloa colona</i> and <i>Digitaria marginata</i> — on roots.
<i>Lachnus thujafoliae</i> , Theob.	<i>Thuja orientalis</i> .
<i>Lachnus</i> sp.	<i>Thuja orientalis</i> .
<i>Neophyllaphis podocarpi</i> , Tak.	<i>Podocarpus elata</i> .
<i>Myzocallis annulata</i> , Hartig.	<i>Quercus</i> spp.
<i>Myzocallis</i> sp.	<i>Arundinaria falcata</i> (in Sydney).

List of identified aphides and their host-plants.—Continued.

<i>Greenidea ficicola</i> , Tak.	.. ..	<i>Ficus glomerata</i> , <i>F. hilli</i> , and <i>F. macrophylla</i> in Brisbane; <i>F. parcelli</i> , <i>F. rubiginosus</i> and <i>F. stephanocarpa</i> in Sydney. <i>Quercus</i> sp. (on one occasion only).
<i>Anuraphis</i> sp.	.. ..	<i>Hordeum</i> .
<i>Aphis tulipae</i> Boyer	.. ..	<i>Daucus carota</i> .
<i>Aphis sacchari</i> Zehnt.	.. ..	<i>Saccharum officinarum</i> .
<i>Brevicoryne brassicae</i> L.	.. ..	<i>Brassica</i> sp.
<i>Hyalopterus arundinis</i> Fab.	.. ..	<i>Phragmites communis</i> .
<i>Rhopalosiphum nymphaeae</i> L.	.. ..	<i>Vallisneria</i> .
<i>Macrosiphoniella sanborni</i> Gill.	.. ..	<i>Chrysanthemum leucanthemum</i> .
<i>Macrosiphum rosae</i> L.	.. ..	<i>Rosa</i> spp.
<i>Macrosiphum gei</i> Koch.	.. ..	<i>Gladiolus</i> and <i>Musa</i> (rare).
<i>Myzus persicae</i> Sulz.	.. ..	<i>Ageratum</i> , <i>Bougainvillea</i> , <i>Brassica</i> , <i>Cineraria</i> and <i>Papaver</i> .
<i>Fullawayella violae</i> Perg.	.. ..	<i>Viola</i> .
<i>Idiopterus nephrolepidis</i> Davis	.. ..	<i>Platyserium</i> spp., <i>Asplenium nidus</i> .
<i>Pentalonia nigronervosa</i> Coq.	.. ..	<i>Musa</i> spp., <i>Caladium</i> , <i>Alocasia macrorrhiza</i> , <i>Alocasia</i> sp. (African). <i>Dieffenbachia magnifica</i> , <i>Hedychium</i> , <i>Ravenala</i> , <i>Strelitzia</i> , <i>Alpinia vittatavariegata</i> , <i>Opuntia</i> (flowers).
<i>Geoica lucifuga</i> Zehnt.	.. ..	<i>Saccharium officinale</i> (roots).
<i>Oregma</i> sp.	.. ..	<i>Dactyloctenium</i> and rarely <i>Setaria macrostachya</i> .
<i>Ceratachis lataniae</i> Bois.	.. ..	<i>Epidendrum</i> and other Orchidaceae.

The above are only some of the aphides gathered from over eighty genera of plants, but the majority of the aphides are identified only as far as the genera. One unidentified species of genus *Aphis* can be recognised as common on *Eucalyptus paniculata*, *Tristania conferta* and *Banksia integrifolia*. In Sydney it infests at times the avenues of *Tristania*, and it is not uncommon around Brisbane on saplings, and cows invariably eat the leaves containing the aphides when they find them.

There are two species of Prickly Pear (*Opuntia*), a green one on the roots and a black one on the pads. Also *Polygonum hydropiper* has two, an *Aphis* and a *Macrosiphum*, one clustering on the stems, the other on the underside of the leaves.

There are twenty-nine genera of indigenous plants supporting aphides in Queensland, but there is no evidence to indicate that any of these aphides are indigenous too.

For the naming of practically all plants in this paper, I wish to acknowledge my indebtedness to Mr. C. T. White, Government Botanist, and to Mr. E. W. Bick, Director of the Brisbane Botanical Gardens.

LIST OF INDIGENOUS PLANTS HARBOURING APHIDES.

DICOTYLEDONS—

Bixineae	<i>Scolopia Brownii</i>	<i>Aphis</i> .
Portulacaceae	<i>Portulaca oleracea</i>	<i>Aphis</i> .
Malvaceae	<i>Malvastrum tricuspidatum</i>	<i>Myzus</i> .
Sterculiaceae	<i>Sterculia discolor</i>	<i>Aphis</i> .
Zygophylleae	<i>Tribulus</i>	<i>Aphis</i> .
Meliaceae	<i>Flindersia</i>	<i>Aphis</i> .
Sapindaceae	<i>Harpullia pendula</i>	<i>Myzus</i> .

LIST OF INDIGENOUS PLANTS HARBOURING APHIDES.

DICOTYLEDONS.—*Continued.*

Myrtaceae	Eucalyptus paniculata	Aphis.
	Tristania conferta	Aphis.
Araliaceae	Astrotricha floccosa	Anuraphis.
Rubiaceae	Sarcocephalus Bartlingii	Macrosiphoniella.
Polygonaceae	Polygonum hydropiper	Aphis, Macrosiphum.
	Rumex Brownii	Aphis, Myzus.
Proteaceae	Banksia integrifolia	Aphis.
Loranthaceae	Loranthus longiflorus	Aphis.
Urticaceae	Ficus spp.	Greenidea.
	Ficus cunninghamii	Aphis.

GYMNOSPERMEAE—

Taxaceae	Podocarpus elata	Neophyllaphis.
----------	------------------	----------------

MONOCOTYLEDONS—

Orchideae	Dendrobium	Cerataphis.
Liliaceae	Cordyline	Pentalonia, Aphis.
Aroideae	Alocasia macrorrhiza	Pentalonia.
Cyperaceae	Cyperus rotundus	Aphis, Myzus.
Gramineae	Digitaria marginata	Anoecia, Aphis.
	Echinochloa colona	Anoecia, Aphis.
	Dactyloctenium	Oregma.
	Setaria macrostachya	Oregma.
	Imperata arundinacea	Aphis.
	Phragmites communis	Hyalopterus.

CRYPTOGAMS—

Filices	Asplenium nidus	Idiopterus.
	Platyserium spp.	Idiopterus.

Since the above was written, Tribe Setaphidini (subfamily Aphidinae) has been found at Southport, in the scrub along the main beach, on *Breynia oblongifolia*. This species of *Setaphis* appears to be undescribed and may possibly be indigenous.